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Operation And Monitoring Of Adsorptive Arsenic Removal Systems

EPA Arsenic Workshop

Cincinnati, OH

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Glen Latimer

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Daily Operation Monitoring

- **Flow monitoring**
- **Pressure drop monitoring**
- **Chemical addition monitoring**
- **Arsenic performance monitoring**

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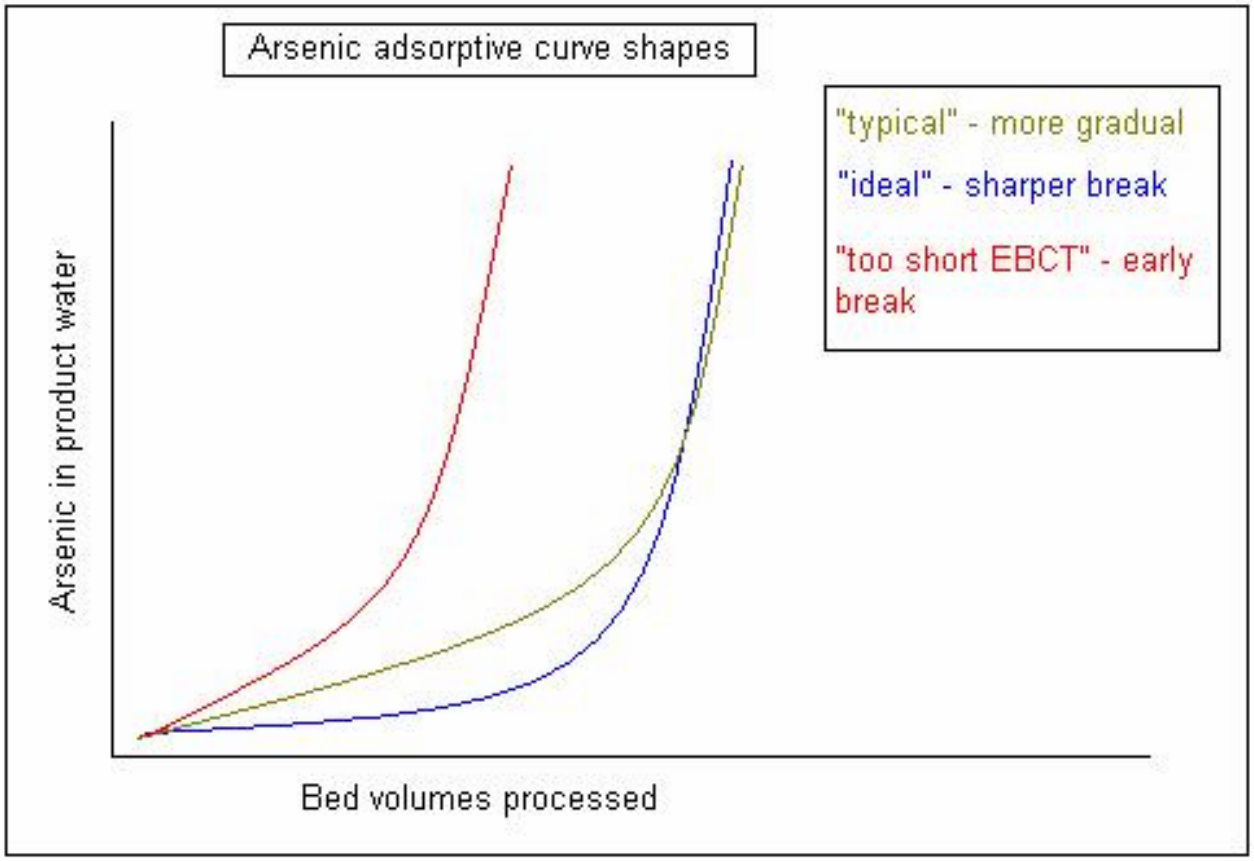
Flow Monitoring - Higher Than Design Flow

- **Short EBCT**
- **Change in breakthrough time**
- **Change in breakthrough slope**



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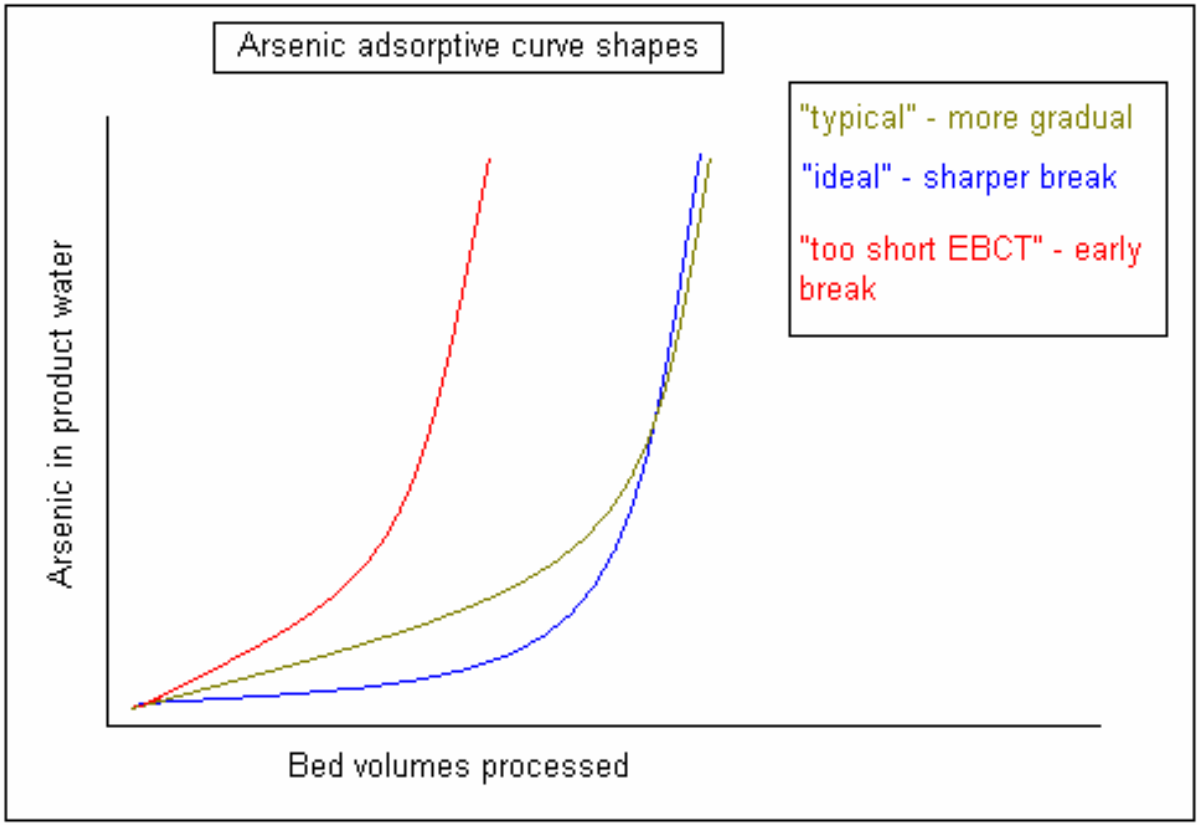
Flow Monitoring - Lower Than Design Flow Effects

- **Uneven distribution**
- **Channeling and wall effects**
- **Low flow indicating fouling**



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Pressure Drop Monitoring

- Manual pressure gauges or electronic transmitters can be used
- Suspended solids in feed water (media fouling)
- “Mud ball” forming
- Channeling
- Media fines collecting on lower distributor
- Insufficient flow
- Damage to underdrain
- Media loss

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Chemical Monitoring - Chlorine

- **Chlorine feed and monitoring**
- **Chemical storage level**
- **Residual monitor maintenance**
- **Loss of oxidation / As^{+3} leakage**

Online Chlorine Monitor

Chemical Monitoring - pH Adjust

- **pH Adjustment**
- **Chemical storage level**
- **Probe cleaning and calibration**
- **Loss of pH control / arsenic leakage**

Online pH Monitor

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Arsenic Analysis

- **Lab analyses**
  - **Atomic Adsorption (AA)**
  - **Inductively Coupled Plasma Mass Spectrometry (ICP-MS)**
- **Detection limits**
  - **AA: 2.0 ppb**
  - **ICP-MS: <0.50 ppb**
- **Location**
- **Frequency**

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Atomic Absorption (Graphite Furnace)

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ICP Mass Spectrophotometer

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Arsenic Field Test Kits

- **Valuable for piloting and plant optimization**
- **Limitations**
- **Accuracy**

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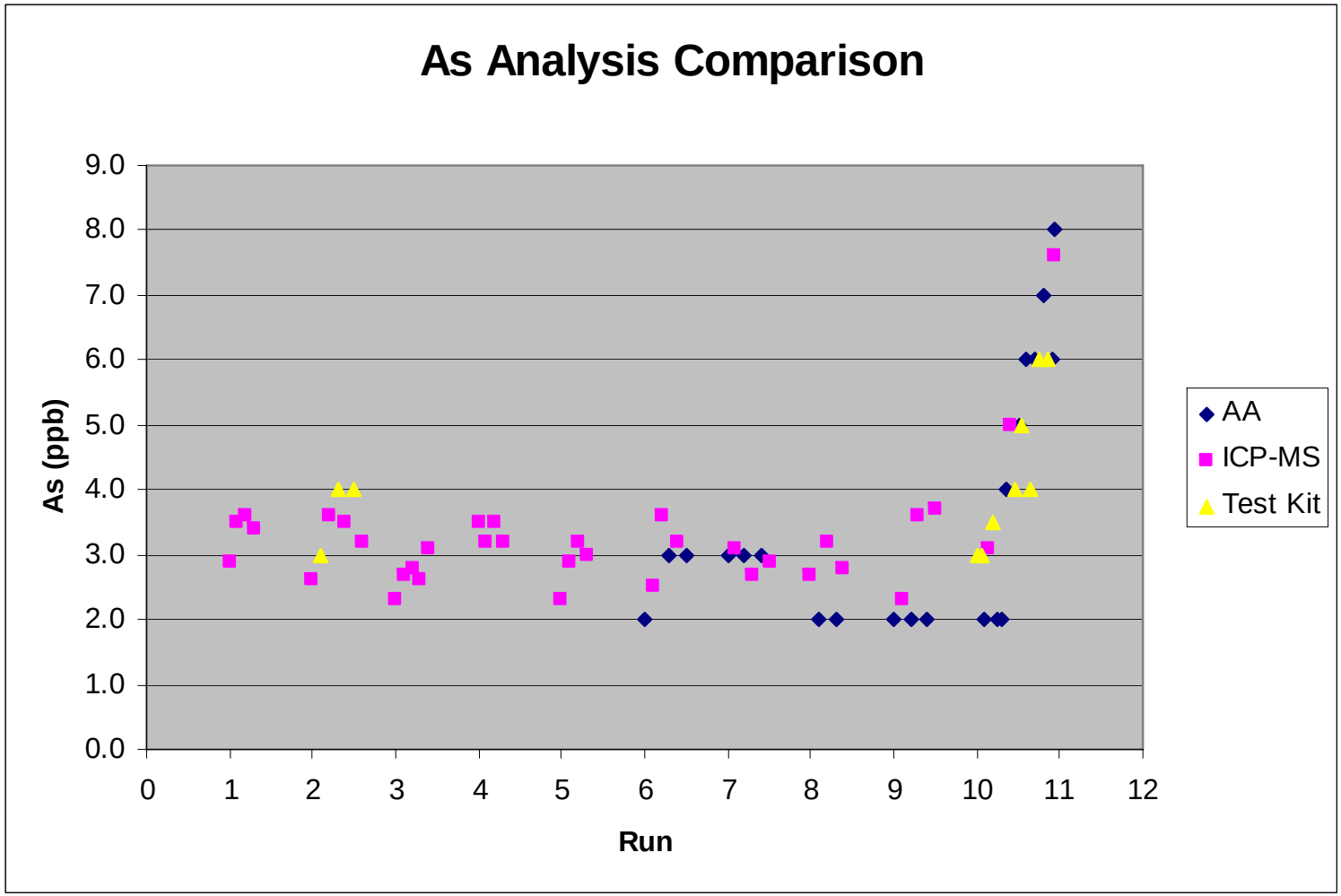
Arsenic Analytical Comparison



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Future On-line Arsenic Analyzers

- **Several technologies currently under development**
- **Extremely valuable in plant optimization as well as monitoring for compliance**
- **Elimination of 3rd party laboratory testing will result in cost savings for a utility**

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Arsenic Adsorptive System Control Panel

- **PLC based controls**
- **Minimal automation provides for automatic backwashes**
- **PID control loop for pH control**

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Four Column Arsenic Adsorptive Pilot System

- 4 separate column allow for head-to-head testing of different media
- Manual system with instantaneous and totalizing flow meters
- Chemical injection point for oxidant and pH control

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Valley Vista Arsenic Adsorption System

- 37 gpm lead/lag design
- PLC controls and actuated valves control basic start/stop and backwash functions
- Backwash waste sent to holding tank and settled water and recycled to raw water feed
- Automated pH control

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Valley Vista Arsenic Adsorption System

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Questions?
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